Auto industry steel project to boost efficiency, safety

July 11, 2013

Los Alamos partners with Colorado School of Mines in $1.2 million clean-energy manufacturing project

LOS ALAMOS, N.M., July 11, 2013—Higher-strength, lighter-weight steels could be coming to a car near you in the near future as part of a U.S. Department of Energy advanced manufacturing initiative. Los Alamos National Laboratory and Colorado School of Mines (CSM) researchers are lending their expertise to a three-year, $1.2 million project to develop a new class of advanced steels for the automotive industry, materials that will be produced using cleaner manufacturing methods and eliminating the traditional heat-treatment and associated costs and hazards of the process.

“The new project’s goal is to eliminate the time and energy required to heat these parts to around 900°C (red-hot) by creating steels that will meet the safety requirement and still be formable at room temperature,” said Kester Clarke, one of the Los Alamos researchers. The current method for forming safety-critical “b-pillars” for automotive applications is a process called hot-stamping.

As experts in phase transformations in steels, microstructural evolution and alloying/ processing response, researchers will use specialized Los Alamos capabilities to help meet the project’s advanced manufacturing initiatives.

The project, “Quenching and Partitioning Process Development to Replace Hot Stamping of High Strength Automotive Steel,” is led by CSM Metallurgical and Materials Engineering Professor Emmanuel De Moor, along with colleagues David Matlock and John Speer of the school’s Advanced Steel Processing and Products Research Center. Los Alamos National Laboratory researchers Amy Clarke (a Mines alumna), Robert Hackenberg and Kester Clarke (also a Mines graduate) are also part of the effort as well as industrial partners AK Steel, General Motors Corporation, Nucor Steel, Severstal, Toyota and United States Steel Corporation.

Specialized equipment at Los Alamos such as a quench dilatometer will be used to provide critical details about phase transformations during heating and cooling, which will, in turn, guide the development of steel compositions and thermal processing routes. Advanced microstructure characterization techniques, including electron microscopy, neutron diffraction and bulk thermal- and deformation-processing capabilities will be used to simulate industrial-scale processing.

The project is part of a DOE $23.5 million investment in innovative manufacturing R&D projects. This new funding for advanced manufacturing—as well as $54 million invested in 13 projects during the first round of selections in June of 2012—will serve as a ground floor investment in Energy Efficiency and Renewable Energy's new Clean Energy Manufacturing Initiative. DOE Energy Efficiency and Renewable Energy (EERE) Office hosted a summit in Washington DC June 24-25.

*Caption for image below: A sheet-steel sample undergoes mechanical testing in a Bending Under Tension test apparatus. This test combines analysis of friction, tooling radius, and material properties to provide an accurate determination of formability. Photos courtesy of Colorado School of Mines.*PublicationsA. Clarke, S. Imhoff, P. Gibbs, J Cooley, C. Morris, F. Merrill, B. Hollander, F. Mariam, T. Ott, M. Barker, T. Tucker, W.-K. Lee, K. Fezzaa, A. Deriy, B. Patterson, K. Clarke, J. Montalvo, R. Field, D. Thoma, J. Smith, and D. Teter, Proton Radiography Peers into Metal Solidification. Scientific Reports3, 2020; DOI:10.1038/srep02020 (2013).Related Links:Proton Radiography Peers into Metal Solidification